

**City University of Hong Kong
Course Syllabus**

**offered by Department of Management Sciences
with effect from Semester A 2018 / 19**

Part I Course Overview

Course Title: Predictive Analytics and Forecasting

Course Code: MS4212

Course Duration: One Semester

Credit Units: 3

Level: B4

- Arts and Humanities
 Study of Societies, Social and Business Organisations
 Science and Technology

Proposed Area:
(for GE courses only)

Medium of Instruction: English

Medium of Assessment: English

Prerequisites:
(Course Code and Title) MS3252 Regression Analysis

Precursors:
(Course Code and Title) MS3251 Analytics using SAS

Equivalent Courses:
(Course Code and Title) MS4212 Business Forecasting

Exclusive Courses:
(Course Code and Title) MS4102 Business Forecasting Methods

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course aims to:

- Develop students' ability to solve real-life predictive analytics and forecasting problems.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	<u>Describe</u> the purpose and the procedure of conducting commonly used qualitative and quantitative predictive analytics and forecasting techniques and the difference among the techniques, and emerging use of internet time series data for forecasting	40%	✓	✓	
2.	<u>Apply</u> the concepts and methods of qualitative and quantitative techniques to solve predictive analytics and forecasting problems using contemporary computer software such as SAS, Excel, R, Python	60%	✓	✓	✓
		100%			

* If weighting is assigned to CILOs, they should add up to 100%.

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.			Hours/week (if applicable)
		1	2		
Interactive Lectures	Students listen to the concepts and methods of commonly used qualitative and quantitative predictive analytics and forecasting techniques, with emphasis on real-life applications. Students discuss the major issues arising from the applications and case study problems	✓	✓		
Computer Lab	Students learn and practise the use of contemporary computer software (such as SAS, Excel, R, Python) to solve predictive analytics and forecasting problems and discuss the major issues arising from the applications and the use of computer software	✓	✓		
Group Project	Students work on a group project to apply their knowledge learnt in the course and develop their collaborative learning and presentation skills. Furthermore, students present their findings in a written report. The requirement of in-class presentation will be determined by the course examiner and announced to the students at the beginning of the course.	✓	✓		

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2						
Continuous Assessment: <u>50</u> %								
Test	✓	✓					20%	
Group Project (may include Computer Exercises)	✓	✓					30%	
Examination: <u>50</u> % (duration: 2 hours, if applicable)								
							100%	

* The weightings should add up to 100%.

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Test	A test is given to assess students' professional knowledge of the concepts, the techniques and the applications they have learned in the past weeks.	Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.	Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.	Some evidence of understanding of the subject; ability to perform basic statistical model building and data analysis for marketing research.	Adequate familiarity with the subject matter; shows marginal ability to perform basic statistical model building and data analysis for marketing research.	Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited or irrelevant use of literature.
2. Group project	Students work in teams to apply the methods to solve the predictive analytics and forecasting problems using contemporary computer software such as SAS, Excel, R, Python and give verbal and written presentation of the problem and the findings.	Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior application of subject matter; evidence of extensive knowledge base. Highly effective use of language and excellent presentation skills.	Evidence of being able to apply the subject matter; evidence of critical capacity and analytic ability; reasonable understanding of issues; relevant use of literature. Effective use of language and good presentation skills.	Some evidence of being able to apply the subject matter; some evidence of critical capacity and analytic ability; some evidence of understanding the issues; ability to develop solutions to simple problems. Adequate command of the language and presentation skills.	Sufficient ability to apply the subject matter to enable the student to progress without repeating the project. Inadequate command of the language and little presentation skills.	Little or no evidence of being able to apply the subject matter; weakness in critical and analytic skills; limited or irrelevant use of literature. Poor use of the language and presentation skills.
3. Written examination	The examination is designed to assess students' professional knowledge of the concepts, the techniques and the applications they have learned in the whole course.	Strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base.	Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.	Some evidence of understanding the subject; ability to develop solutions to simple problems.	Adequate familiarity with the subject matter to enable the student to progress without repeating the course.	Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited or irrelevant use of literature.

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

1. Introduction

An overview of qualitative and quantitative predictive analytics and forecasting methods. Measuring Forecast accuracy. Naïve forecasting methods. Forecasting with internet time series data.

2. Smoothing and Decomposition Methods

Simple and double moving averages. Simple and double exponential smoothing. Smoothing models for seasonal data. Additive and multiplicative decomposition methods.

3. Regression Models

Forecasting using simple and multiple regression models.

4. ARIMA Time Series Models

Stationarity of time series. Transformation for achieving stationarity. Autocorrelations and partial autocorrelations. Autoregressive models. Moving average models. ARIMA models. Box-Jenkins methodology of model building.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Bowerman B L, O'connell R T and Koehler A B, <u>Forecasting, Time Series and Regression: An Applied Approach</u> , 4/e, Thomson, 2005
2.	Hanke J E and Wichern D W, <u>Business Forecasting</u> , 9/e, Prentice Hall, 2014
3.	Gilliland M, Sglavo U, Tashman L, <u>Business Forecasting: Practical Issues and Solutions for Forecasters</u> , John Wiley & Sons, 2015
4.	Woodward W A, Gray H L and Elliott A C, <u>Applied Time Series Analysis with R</u> , Boca Raton, FL: CRC Press, 2017
5.	Pal A, Prakash PKS, <u>Practical Time Series Analysis: Master Time Series Data Processing, Visualization and Modeling with Python</u> , Packt Publishing, 2017

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Abbott D A, <u>Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst</u> , 1/e, Wiley, 2014
2.	Makridakis S, Wheelwright S C and Hyndman R J, <u>Forecasting: Methods and Applications</u> , 3/e (Paperback), Wiley, 2008
3.	Montgomery D C, Jennings C L and Kulachi M, <u>Introduction to time series analysis and forecasting</u> , Wiley, 2015